115 referred cases had been given both morphin and cathartics before we saw them. No case of obstruction has been refused operation. The deaths include two that died after leaving the hospital, one gangrene of the lung and one abscess of the lung. In both, the abdominal pathology was completely relieved. Intestinal obstruction surgery is either delightful or distressing, depending on early or late operation.

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CHRONIC PYURIA IN CHILDREN*

REPORT OF CASES

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DISCUSSION *by W. W. Cross, M.D., Oakland; William E. Stevens, M.D., San Francisco; George G. Reinle, M.D., Oakland.*

FROM a urological point of view one of the important contributions that the pediatrician has made in establishing his specialty is the insistance upon a routine examination of urine in every case. I think that he will admit that in consultation, he many times makes his diagnosis, not by superior intelligence, but by superior care, and insistence upon a thorough examination, which includes an examination of a properly obtained specimen of urine. It is estimated that one per cent of the infants and children in his practice will be found to have pyuria. The presence of pus is the commonest sign of urinary pathology, and may or may not be accompanied by other signs or symptoms.

A large percentage of the acute infections of the urinary tract clear up either spontaneously or under intelligent medical care; these are rarely seen by the urologist. A perceptible number, however, in spite of time, hygiene and medication become chronic, failing to improve at all, or recurring so frequently that the attending physician is at his wits' end. It is with this small group that this paper deals.

CHRONIC PYURIA OF ACUTE INFECTIOUS ORIGIN

Chronic pyuria in children can be classified under two main headings, namely, those that have begun as acute urinary infections without any apparent provoking cause, and those in which infection is secondary to changes in the urinary tract which favor stasis. Chronic pyuria, following an acute urinary infection, is usually secondary to an infection elsewhere and may begin acutely in the course of a tonsillitis, influenza, gastro-intestinal disturbance, et cetera. Often the lack of early treatment allows the disease to drag on into a chronic stage which may last for weeks or months with frequent acute exacerbations. It is surprising how this type of infection responds to treatment after the original focus of infection has been removed.

Cystoscopically very little is found except inflammatory changes similar to those found in the adult. The pelvic outline and the ureters are normal, save for the inflammatory dilatation.

CHRONIC PYURIA SECONDARY TO STASIS

The cases of chronic pyuria secondary to changes in the urinary tract which favor *urinary stasis,* make up a far *larger* group than is commonly supposed. This has been emphasized by the several excellent papers that have appeared within the last few years. This obstructive type usually remains silent until announced by an acute infection occurring above the point of obstruction either secondary to an acute infection elsewhere, or an infection of the urinary tract only. It runs a course at first not unlike the usually acute urinary infection but soon becomes chronic, rarely if ever clearing up spontaneously. Unfortunately too many of these cases are treated expectantly with medication only, so that in the intervening time between the onset and final diagnosis much damage is done to the kidneys. Conditions favoring stasis may be grouped under those that are acquired and those that are congenital. The most commonly acquired obstruction is secondary to traumatism or local infection which is followed by stricture of some type. The congenital type is seen largely in children, the incidence of congenital lesion of the urinary tract found at postmortem being from 1.5 to 2.5 per cent. This percentage should be higher because the majority of children with chronic urinary disturbances are neither cystoscoped nor autopsied.

CONGENITAL ANOMALIES FAVORING STASIS

Anomalous lesions, so common in the genito-urinary system, are found most frequently in the kidneys and ureters, although there is no portion of the urinary tract that is exempt. The kidneys and ureters, in the kaleidoscopic changes that take place during development, seem particularly apt to form figures that vary from the so-called normal. The classical kidneys, pelves and ureters of the anatomy are the exception rather than the rule. Eisendrath and Papin, in an exhaustive study of renal and ureteral anomalies have classified kidney anomalies under those of number, volume, form, location, median fusion, rotation, reduplication of the pelves and ureters, anomalies of the pelves and anomalies of the vessels. They have also classified ureter anomalies under those of caliber and form, the latter including congenital stricture, dilation, valves and spiral twists and kinks, all of these potential causes of stasis invite infection and are found only by a careful cystoscopic examination, usually after infection has taken place. The first indication of their presence in the majority of cases is pyuria.

Congenital anomalies of the urinary tract favoring stasis appear in two general zones, the upper, including the kidneys and ureters, and the lower, including the bladder neck and urethra. The upper zone is involved equally in the male

* Read before the Urology Section, California Medical Association at the Fifty-eighth Annual Session, May 6-9, 1929.

and the female, while the lower zone is primarily involved in the male and is characterized by congenital stenosis of the internal urinary meatus, congenital stricture of the urethra and congenital valves in the posterior urethra. Occasionally we see a congenital stricture in the internal urinary meatus of the female child sufficiently pronounced to cause stasis. Congenital diverticulum of the bladder is a cause of pyuria, but is not common.

In order to emphasize the importance of careful cystoscopic investigation whenever chronic pyuria is present in children, I have taken the following series of cases which show particularly well the fallacy of long-continued medical treatment. In all of these cases the attention of the attending physician was called to the urinary tract by the pyuria and because of that fact a urological examination was eventually asked for. Several excellent articles in the literature dealing with congenital anomalies of the urinary tract have appeared recently so that the cases recorded here are not new but simply add support to the argument that all chronic cases of pyuria in children as well as in adults should be given the benefit of a thorough and early urological investigation.

Before reporting briefly eleven cases of pyuria due to congenital deformities which favored urinary stasis, I wish to emphasize the fact that a cystoscopic examination not only picks out the congenital types that are improved by surgery, but it also reveals a certain number which can be classified under the head of nonobstructive pyuria, a group which is often neglected but is amenable to proper medical and cystoscopic treatment.

REPORT OF THREE CASES OF CHRONIC NONOBSTRUCTIVE PYURIA

A. Nonobstructive chronic pyuria. The following are examples of three types that have come frequently under our observation:

1. Chronic pyelitis, unilateral or bilateral. In this type the major infection appears to be in the kidney with little or no inflammatory change seen in the bladder. Specimen of urine from the affected kidney shows numerous pus cells.

Case 1.—P. J., female, age two years; seen October 12, 1928, because of chronic pyuria discovered three months before. Has had periodic attacks of fever accompanied by great increase of the pus in the urine.

Cystoscopic Diagnosis.—Bilateral pyelitis without evidence of deformity of the urinary pelvis or ureters.

Treatment and Subsequent History.—Patient responded to internal medications and bladder irrigations.

2. Chronic cystitis and pyelitis. In this type the inflammatory changes in the bladder are very evident and the amount of pus in the bladder urine greatly exceeds that found in the kidney specimens.

Case 2.—O. D., female, age ten years; seen April 12, 1926, because of chronic pyuria discovered one year previous during a routine examination. How long before this the pyuria had existed could not be determined. The patient had never had any acute urinary symptoms and had apparently been in good health. The urine showed many pus cells, pus clumps and motile bacilli.

Cystoscopic Diagnosis.—Chronic cystitis and probable pyelitis (only a few motile bacilli were found in the kidney urine). Renal pelves and ureters were normal.

Treatment and Subsequent History.—The patient was pus free after eleven months and has been normal since September, 1928.

3. Chronic cystitis. In this type all the pathology was found in the bladder.

Case 3.—P. B., female, age six years; seen January, 1929, because of pyuria which had been present since the child was six months old. At varying intervals, she had fever and chills and the urine developed a very foul odor.

Cystoscopic examination showed chronic cystitis, dilated bladder, and a normal upper urinary tract. This case is still under treatment and has not changed perceptibly.

These three cases are representative of a group of children having chronic pyuria which we have seen, and who have responded to treatment in the most part. No congenital deformity was present.

REPORT OF ELEVEN CASES OF CHRONIC PYURIA WITH CONGENITAL ANOMALY

B. The following eleven cases are reported because of chronic pyuria which cystoscopic examination showed to be secondary to congenital deformity located somewhere along the urinary tract.

1. Deformities in the upper urinary tract.

Case 1.—B. G., female, eighteen months old; seen because of symptomless pyuria dating back six months, discovered during an acute respiratory infection.

Cystoscopic Diagnosis.—Stricture of the right ureter in the upper fourth, right hydronephrosis and hydro-ureter, secondary pyelitis. Diagnosis confirmed by right nephrectomy. Child apparently normal March 25, 1929.

Case 2.—J. M., female, twenty-four months old; seen June, 1928, because of pyuria and periodic attacks of abdominal cramps dating from birth.

Cystoscopic Diagnosis.—Left hydronephrosis, hydro-ureter and secondary pyelitis. Diagnosis confirmed by a left nephrectomy August 3, 1928. However, a double hydro-ureter and pelvis was found which was not diagnosed cystoscopically. The child is now well and pus free.

Case 3.—B. K., female, age fifteen months; seen September 25, 1928, because of chronic pyuria. The patient is pale, poorly nourished and does not wish to talk.

Cystoscopic Diagnosis.—Right hydro-ureter and pyohydronephrosis. No evidence of stricture except possibly at right urethral outlet.

Subsequent History.—The child was cystoscoped again April 13, 1929. The pyuria had persisted and the findings were practically the same. The child is doing poorly and operation has again been recommended.

Case 4.—L. G., female, age nine years; since the age of five, the patient has had abdominal pains every three to six months. That patient was sent to the uro-

logical department because of pyuria which had persisted in spite of removal of tonsils and the usual medical treatment.

Cystoscopic Diagnosis.—Right hydropyonephrosis with stricture at the right ureteropelvic junction. Nephrectomy was recommended, but refused. There has been no abdominal pain since last seen and the urine has been free of pus for seven months.

2. Deformities of the lower urinary tract.

CASE 5.—F. T., male, age six and one-half years; seen September 30, 1926, because of pyuria and chronic gastro-intestinal symptoms. Bladder enormously distended, a poor urinal stream, residual urine 308 ccs. and capacity of 700 ccs. Functional test in two hours was 22½ per cent.

Cystoscopic Diagnosis.—Congenital stricture of the internal urinary meatus. Bilateral hydro-ureter and hydronephrosis, secondary infection of the whole urinary tract above the stricture.

Subsequent History.—This case was seen by Doctor Hinman later and is apparently improving under operative treatment.

CASE 6.—B. T., age two years, eight months; seen February 15, 1926. Six months previous he was examined because of anuresis, after which time pus was found in the urine. He was treated for pyelitis for six months without any improvement when he was seen by Dr. Elmer Belt of Los Angeles, who made a cystoscopic diagnosis of the stricture of the posterior urethra due to two congenital valves which were broken down, apparently by instrumentation. The patient was referred to me and was last seen January 17, 1927, at which time the urine was normal.

CASE 7.—J. T., male, age two years; seen September 2, 1929, because of pyuria, sepsis, and a severe anemia. The patient was referred to me by Doctor Hinman and the case was followed up to January 12, 1929, when the patient died of uremia precipitated by an attack of so-called flu.

Cystoscopic Diagnosis.—Stricture at the neck of the bladder with bilateral hydro-ureter and hydronephrosis plus secondary infection. Functional test was never over 1½ per cent in two hours, but the patient improved remarkably under a retention catheter and was to all outward appearances a normal child up to six weeks before death.

3. Adult congenital cases. Many of the congenital types must die during childhood as did case 7, for only a few cases are seen in adult life that can be definitely said to be congenital.

CASE 8.—A. J., male, age thirty years; seen March 4, 1925, because of chronic pyuria, which he had known to be present for the last three years. The discovery was made after an injury to his left side, but this was probably incidental

Cystoscopic Diagnosis.—Stricture of the left urinary meatus and also at the ureteral pelvic junction, left hydro-ureter and left pyohydronephrosis. The cystoscopic examination was confirmed by operation, 4000 cc. of pus being removed from a large sacculated kidney. The kidney was not tuberculous.

CASE 9.—J. R., male, age about twenty-two; seen November 5, 1928, because of pain in the left side and pyuria. Patient had complained of this pain since he was thirteen years of age.

Cystoscopic Diagnosis. — Left hydropyonephrosis with stricture at the left ureteral pelvic junction. This was verified by operation, an enormous sacculated kidney being found extending from the diaphragm to the pelvis and containing an enormous quantity of pus. This patient died twelve hours after operation from shock, probably precipitated by postoperative hemorrhage.

CASE 10.—E. H., female, aged seventeen years; seen July 19, 1928, because of pain in the left side and pyuria which had dated back for over a year. Cystoscopic diagnosis revealed a double ureter and double pelvis on the left side with a pyelitis in the lower pelvis of the left kidney. This was verified on several occasions during cystoscopic treatment. On March 8, 1929, about nine months after treatment began, the patient was apparently well.

CASE 11.—E. K., age thirty years; reported March 9, 1929, because of pyuria and difficulty in starting urine. As far back as he can remember, he has had bladder trouble, being taken by his parents from one health resort to another as a child in hope of relief.

Cystoscopic Diagnosis.—Stricture at the internal urinary meatus, multiple small diverticula of the bladder, bilateral hydro-ureter and hydronephrosis and secondary cystitis and pyelitis with a urine of 500 cc.

Diagnosis was confirmed by operation, a V-shaped section being taken out of the stricture at the bladder neck. The patient was relieved of his old symptoms, gained considerable weight, but his pyuria has persisted, although to a less degree ever since.

Comment.—This case is undoubtedly of congenital origin but unrecognized during the course of years.

CONCLUSIONS

Chronic pyuria is the most common sign of urinary pathology. Its presence should be sufficient cause for a complete cystoscopic examination. The cystoscopic findings alone will determine whether the case is medical, surgical, or both.

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DISCUSSION

W. W. CROSS, M.D. (1624 Franklin Street, Oakland). It is superfluous to say I am interested in this subject. The essayist has covered the ground well. It would appear that this paper should have been read before the general section, as the urologist is familiar with the bacterial infection of the urinary tract, while the members of the profession working in other lines apparently are not impressed.

The mechanical factors encountered can only be corrected by the urologist and must be considered in the proper conduct of patients afflicted with this condition. Young, in his work, discussed them under general infections, the urinary tract participating, and evidently his position is well taken.

Cabot, in his work, gave to Roundtree the credit for working out the pathology of bacterial nephritis. The pathology is definite and the syndrome is constant with wide variation in the individual symptoms. Patients so afflicted usually have a low blood pressure, the nonprotein-nitrogen is not elevated markedly if any. Death is due to terminal sepsis or kidney defeat, the kidney gradually disintegrating. One urologist in New York disclosed in a children's clinic that all the lesions found in the adult were found in children. The infecting organisms vary and multiple infection is not unusual.

As urologists we should be bringing more forcibly the facts which exist in connection with this condition to members in our profession who deal less frequently with them.

WILLIAM E. STEVENS, M. D. (870 Market Street, San Francisco).—It is most deplorable that infants and children have been and are being neglected so far as

the proper urological methods of diagnosis and treatment are concerned. These little sufferers are certainly entitled to just as thorough treatment as adults. We have cystoscopes now for children, and age is no longer a hindrance. Doctor Denny of Yale has cystoscoped the ureter in a male infant only twenty-nine days old. The youngest infant I have cystoscoped and catheterized the kidney was a female infant four months of age. About 50 per cent of cases of pyelitis in children are cured by conservative methods, but the other 50 per cent require cystoscopy and irrigation of the kidney pelvis. I think we should pay more attention to these young patients because they are certainly entitled to our modern methods of diagnosis and treatment.

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GEORGE G. REINLE, M. D. (204 Dalziel Building, Oakland).—This entire paper stresses the early investigation by the urologist. In the large majority of cases of chronic pyuria, if the focal point of infection were treated, recovery would follow a certain period of medical treatment.

Paulsen of Copenhagen reports a series of forty-three cases of pyuria, thirty-nine of which he cured in the average time of five weeks. Four cases he was unable to cure.

The type of case we are particularly interested in is the type that cannot be cured with medical treatment.

An obstruction may cause pyuria; a contracture of the vesical neck, a stricture of the urethra, a stricture of the ureter itself. Any one of these things, if left alone, will eventually develop as Doctor Meads stated, into a diverticulum, a hydronephrosis, or if the stricture be complete, into a cyst of the kidney. These conditions may continue for years until the renal system has been entirely destroyed, and children continue to be treated with medicine for years before they are referred to a urologist for examination. Before leaving home I looked over case histories of pyuria, and within a short period of time I had found twenty-three histories of pyuria that had been admitted and left the hospital without the urine being free from pus. Probably these patients were not treated long enough, or a cystoscopy not made. I can see there is a hazard in cystoscopy for very young children; that hazard is one factor which should be considered, but not to the extent that children should be denied the benefit of a complete urological survey.

POSTOPERATIVE PULMONARY EMBOLISM*

REPORT OF CASE

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DISCUSSION *by W. H. Olds, M.D., Los Angeles; Clarence G. Toland, M.D., Los Angeles; Philip H. Pierson, M.D., San Francisco.*

AMONG surgical tragedies postoperative pulmonary embolism is perhaps the greatest. There is no experience in surgery that is more terrible than to have a patient who is ready to be sent home suddenly die. No successful method of preventing embolism has yet been devised.

CIRCULATION CHANGES AFTER OPERATION

Walters recently stated that manifold physiologic changes follow surgical operation. Virchow in 1846 noted a tendency toward a decrease in the rate of blood flow following operation. This problem therefore presents many angles, which concern not only the physiology and chemistry of the blood and its coagulation normally, but also those factors which retard or accelerate the process or modify the nature and structure of the clot. In the opinion of many, mechanical factors, such as the type of breathing which influences the metabolic rate, or the posture assumed in bed, which may retard the circulation, are of considerable import. Merely being in bed and at rest produces a fall in blood pressure. Walters, Hendricks, and Greene also noted a definite increase in the fibrinogen of the blood and, in most instances an increase in the leukocytes. Blood changes, as noted by Allen, in the first ten days after operation are marked by a decided leukocytosis, a decrease in the number of erythrocytes, a decrease in the total fats of the blood and an eleven per cent increase in the fibrin of the blood, associated with a slight decrease in coagulation time, most pronounced about the sixth day.

ETIOLOGIC FACTORS

Rowntree quotes Snell in regard to the occurrence of embolism in the obese and directs attention to a particular group of obese individuals, usually over fifty years of age, who are especially susceptible to postoperative embolism.

Plummer, quoted by Walters, made the observation that thrombosis and embolism practically never occur in those cases of severe cardiac decompression coincident to hyperfunctioning thyroids. This observation gives additional clinical support to the value of increased metabolism in the prevention of thrombosis and embolism. The recent papers of Rowntree, Shionoya, and Johnson on experimental extracorporeal thrombosis are in support of the hypothesis which Plummer stated from a clinical standpoint. Briefly, these experiments on rabbits were made with the use of the extracorporeal vascular loop *in vivo*, and thrombosis occurred normally in from four to ten minutes. However, when one milligram of thyroxin was administered daily for three days to each rabbit, thrombosis did not occur for from twenty to twenty-five minutes. This lengthening in time persisted for three days.

It is more than likely that other factors in addition to slowing of the rate of metabolism, posture in bed, lowering of the blood pressure and retarding of the circulation are responsible for embolism. As Walters suggests, these factors may only set the stage, and infection or changes in blood fibrin or unknown tissue and blood alterations may be the actual causative agents.

Quoting Speed, Ochsner found that there were seven deaths from embolism in 16,696 operations, or 0.042 per cent. Of this series of operations, 5275 were abdominal in type with five deaths, or 0.1 per cent. Of 528 hysterectomies in the series, there occurred one death from embolism, or 0.2 per cent. Cutler and Hunt, in 1562 cases, found 3.52 per cent lung complications, mostly emboli. They believe that one of every eight patients undergoing a major surgical procedure will have postoperative lung complications and that one of every 142 will die from such complications. Wharton and Pierson state that 50 per cent of deaths following gynecologic surgery are caused

* Read before the Southern California Medical Association meeting at Los Angeles, November 9, 1928.